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A MULTIPATCH COUPLING TECHNIQUE FOR ISOGEOMETRIC ANALYSIS OF GEOMETRICALLY COMPLEX KIRCHHOFF-LOVE SHELLS

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ABSTRACT

This work presents a technique for coupling NURBS patches in isogeometric Kirchhoff-Love shell analysis. Such shells require the C^0- and C^1-continuity to be enforced explicitly across patch boundaries, which is especially challenging for geometrically complex multipatch configurations. The proposed method imposes C^0-continuity constraints globally in a weak sense [1], whereas the C^1-continuity is enforced by a strong point-wise coupling in certain well-chosen collocation points along the interface. This does not require the definition of suitable penalty or stabilisation parameters; the coupling conditions can be derived using only mesh information. They are expressed by means of a master-slave formulation between the interface unknowns. Eliminating the slave variables through a static condensation approach leads to a reduced system matrix. The proposed technique is geometrically flexible; it can be applied both to smooth G^1-continuous surfaces and to patches meeting at a kink, and it allows non-conforming meshes. This is demonstrated using a set of numerical case studies of time-harmonic dynamic shell analysis.

REFERENCES

[1] L. Coox, F. Greco, O. Atak, D. Vandepitte and W. Desmet, A robust patch coupling method for NURBS-based isogeometric analysis of non-conforming multipatch surfaces, *Computer Methods in Applied Mechanics and Engineering*, 316:235–260, 2017.